Heal Force®

# $CO_2$ Incubator

## HF90　HF240

# User　Manual

**Version：2005-07-29** CE

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**Environmental conditions**

* Indoors use.
* Altitude up to 2,000 m.
* The work's Temperature surrounding must be in18℃--30℃ when the unit work in 37℃.
* Maximum relative humidity 80% for temperatures up to 30℃.
* MAINS supply voltage fluctuations up to ±10& of the nominal voltage.
* Transient over-voltages typically present on the MAINS supply category II.
* Applicable RATED POLLUTION degree 2.
* The room must be equipped with adequate ventilation.
* The setup surface must be firm, level, and nonflammable.
* The unit must be set up where it will not be in direct sunlight.
* There is not any hot source nearby the unit.

**Safety Information**

* It is important for you to read these Instruction Manual carefully before using the unit for the first time.
* The $CO_2$ Incubator may only be operated by trained, authorized personnel.
* Maintenance work on the unit may only be performed by the Shanghai Lishen or authorized agents.
* Tissue, materials, or liquids: Which are highly flammable or potentially explosive; Whose vapors form flammable or explosive mixtures with air; Which release toxins; May not be used!
* The pressure of the $CO_2$ supply can be adjusted to a range of 0.8-1 bar ,and cannot be altered.
* $CO_2$ is a kind of gas be representing potential health hazard. The unit is to be repeated at suitable intervals.
* Only qualified personnel using suitable tools may work on supply lines and compressed gas container, bottles, or collective systems in which $CO_2$ is stored for use with the incubator.

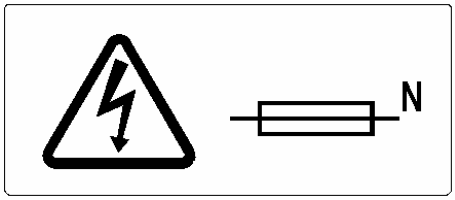
## Warning:

**Warning**: Important operating and/or maintenance instructions. Read the accompanying text carefully.

**Caution:** hot surface.

**Warning:** be careful of the glass.

**Caution:** risk of electric shock.




**CAUTION:** fuse.

**Protective GND indicator**!

## Simple Operational Procedure of HF90 & HF240 $CO_2$ Incubator.

Default set: Temperature－－－37.0℃, %$CO_2$－－－0 %

Please perform 90℃ moist heat disinfection before first using (refer to P.22). Then the following procedures should be strictly followed:

1. Open the outer door and the glass door, and input distilled water (3L) into the pool. Close the doors after doing so.

2. Connect the unit to the source of $CO_2$.

3. Connect the power supply and switch on.

4. Self-checking will be done automatically.〖%$CO_2$〗 and 〖℃〗 will display 〖888〗 and version number. The checking will be terminated after 40s.〖%$CO_2$〗 and 〖℃〗 display the setting data inside the unit.

5. Press the 〖auto-start〗 for about 10s, then the “auto-start” light will be lit.

6. Please open the glass door according to the hints of the〖%$CO_2$〗and〖℃〗display windows.

7. Close the glass door after 1 minute, and the unit will do AUTO-START.

8. Wait for 16 to 24 hours.

9. Adjust the exit pressure of $CO_2$ source to 1bar（0.1MPa）.

10. Press〖%$CO_2$〗and〖▼〗/〖▲〗to input $CO_2$ setting value（eg.5.0%,7.0% or 0%）.

11. Unit will input the $CO_2$ gas until the setting value.

12. Now, the unit can be used in incubating work.

13. You must set the $CO_2$ value to 〖 .0%〗 according to the “Step 10” after operating before switching off.

14. Open the glass window to spill out the gas, and dry the inner chamber.

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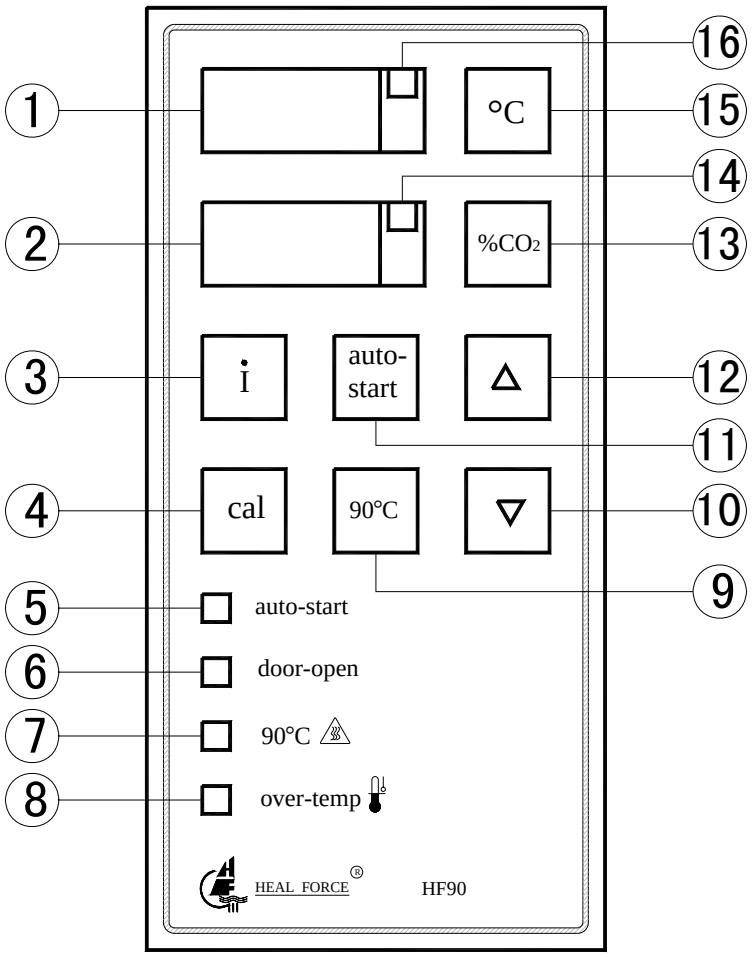
## Control Panel

Picture 1:**HF90 Display Panel**




**Simple Introduction of Display Panel:**

**1. "℃"** display window

Displays the actual value at normal condition. The SET value can be displayed by pressing 〖℃〗 key.

The code of temperature malfunction can be displayed by pressing 〖i〗 key; you can also switch to the special function mode by pressing 〖cal〗 key (See Function Select, P.19).

**2. "%$CO_2$"** display window

Displays the actual value of $CO_2$ concentration; the SET value can be seen by pressing 〖%$CO_2$〗 key.

The code of $CO_2$ malfunction can be displayed by pressing 〖i〗 key; you can also switch to the special function mode by pressing 〖 cal 〗 key (See Function Select, P.19).

**3.** Press 〖**i**〗 key will display the malfunction code.

**4.** Press 〖**cal**〗 key to enter the adjusting mode. Select special functions together with 〖▼〗 and 〖▲〗 key.

**5. "Auto-start" light** will lighten when the equipment begins Auto-starting.

**6. "Door-open" light** will lighten when the glass door is opened.

**7. "90℃" light** will lighten when the equipment begins disinfection at 90℃.

**8. "Over-temp"** will lighten if the temperature is over the set value and the heating progress will be terminated.

## Control Panel

**9.** Press 〖**90℃**〗 key for 10s to enter the disinfection at 90℃ (See P.22)

**10.** 〖▼〗 is used to reduce the value.

**11.** Press 〖**auto-start**〗 key for 10s to enter the Auto-start mode.

**12.** 〖▲〗 is used to increase the value.

**13.** 〖**%$CO_2$**〗 is used to set concentration of $CO_2$

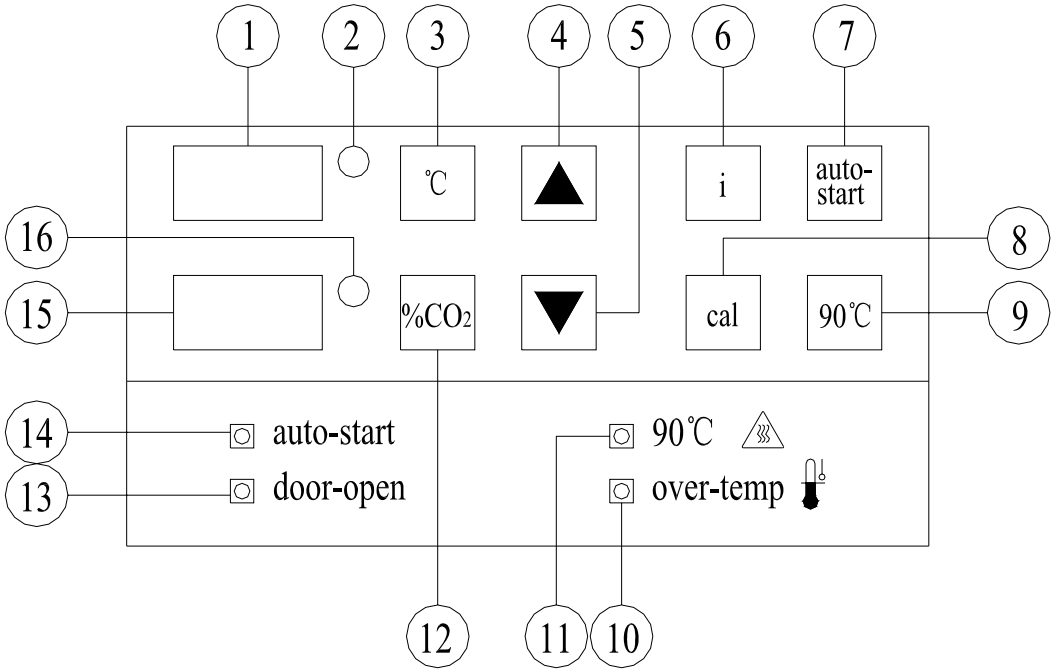
**14. GAS light** will lighten when the gas comes in.

**15.** 〖℃〗 is used to set the temperature.

**16.Heating light** will lighten in heating progress.

## Control Panel

**Picture 2: HF240 Display Panel**




### Simple Introduction of Display Panel:

**1.** **"℃"** Display Window:
Displays the actual value at normal condition. The SET value can be displayed by pressing 〖℃〗 key.

The code of temperature malfunction can be displayed by pressing〖i〗key; you can also switch to the special function mode by pressing 〖cal〗 key (See Function Select, P.19).

**2. Heating light** will lighten in heating progress.

**3.** 〖℃〗 is used to set the temperature.

**4.** 〖▲〗 is used to increase the value.

**5.** 〖▼〗 is used to reduce the value.

**6.** Press 〖**i**〗 key will display the malfunction code.

**7.** Press 〖**auto-start**〗 key for 10s to enter the Auto-start mode.

## Control Panel

**8.** Press 〖**cal**〗 key for over 5 seconds to enter the adjusting mode. Select special functions together with 〖▼〗 and 〖▲〗 key.

**9.** Press 〖**90℃**〗 key for 10s to enter the disinfection at 90℃ (See P.22)

**10. "Over-temp"** will lighten if the temperature is over the set value and the heating progress will be terminated.

**11. "90℃" light** will lighten when the equipment begins disinfection at 90℃.

**12.** 〖**%$CO_2$**〗 is used to set concentration of $CO_2$

**13. "Door-open" light** will lighten when the glass door is opened.

**14. "Auto-start" light** will lighten when the equipment begins Auto-starting.

**15. "%$CO_2$"** display window displays the actual value of $CO_2$ concentration; the SET value can be seen by pressing 〖%$CO_2$〗 key。The code of $CO_2$ malfunction can be displayed by pressing 〖i〗 key; you can also switch to the special function mode by pressing 〖cal〗 key (See Function Select, P.19).

**16. GAS light** will lighten when the gas comes in.

## Introduction

HF90&HF240 Incubator is a delicate lab equipment mainly used in medical area and incubation of cells、tissues and bacilli. There are new functions like disinfection at 90℃, the control of $CO_2$ concentration, and the Micro Control System, which improve the incubation of cells、tissues and other materials. It is an important equipment of High Leveled biological and medical experiments.

Please carefully read this manual before using in order to prevent the inconvenience and the damage to the equipment.

Only the personnel authorized by **Shanghai Lishen** can do the necessary test or maintenance work in order to keep the incubator work normally and accord with the corresponding safety standards.

Please note the Serial No. when handling the malfunction report or speak for components.

Only authorized or trained personnel can operate the equipment.

**Please keep the incubator in steady environment without acute change of temperature, which is helpful to the incubation.**

**The equipment quotes the following standards:**

* Q/TEUC$_8$-2002 (HF90)
* Q/TEUC$_{14}$-2003 (HF240)
* EN 61010-2-010

Equipment Model and its Meaning:

HF----$CO_2$ Incubator

90----Moist heat disinfection system at 90℃.

The inside volume is 151L.

240---Moist heat disinfection system at 90℃.

The inside volume is 240L.

Sorts of equipment:

Common equipment of Class Ⅰ.

The important part is labeled by

## Application

The incubator can simulate the natural data of cells and tissues. **The equipment CANNOT be used to incubate flammable materials.**

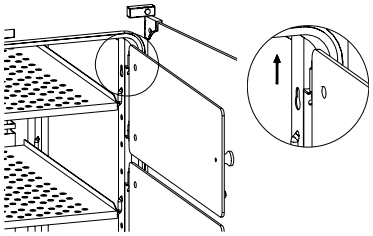
## Equipment Description

■ **Fabric Shell**

Electrolyzed galvanization steel(RAL 9002).
Control parts are made of plastic.
Stainless steel is used in inner chamber.

■ **Inner Components**

The insert shelves are shake resisted, and can be adjusted at 50mm height. You can remove the shelves and support frame simultaneously without any additional tools.



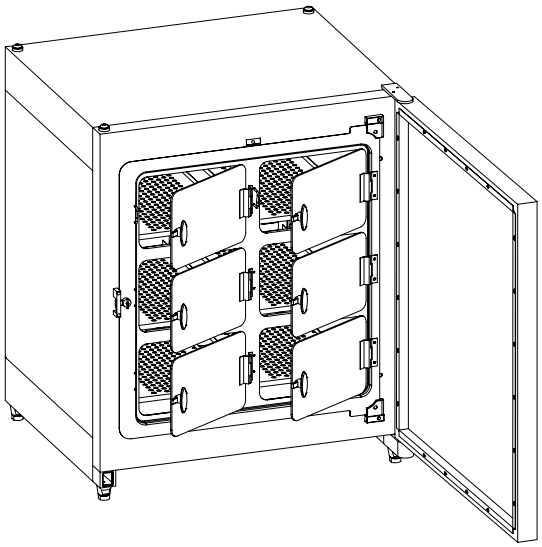
**Picture 3-1: ThreeSmall doors**

■ **Three small doors (HF90)**

There are three small doors located in the front of the inner chamber. The unique design can reduce the gas and the temperature lost when the front door is opened. Way of teardown:(Refer to Figure 3-1 ). Open the small glass door at 45° ,and lift slowly until it is completely removded.

■ **Six small doors (Option for HF240)**

There are six small doors located in the front of the inner chamber. The unique design can reduce the gas and the temperature lost when the front door is opened. Way of teardown:(Refer to Figure 3-2 ). Open the small glass door at 45° ,and lift slowly until it is completely removded.



**Picture 3-1: Small doors**

## Equipment Description

■ **Heating System:**

The heating system is spreaded on the surface of inner chamber to heat it. The heating system is normally placed at the top, back, front, left, right sides of the pool and the front of the outer door.

The condensed water will not appear because the outer door is also heated so that it will keep clear. On the contrary, there will be condensed water on the outer door.

The main heating system allows the equipment to run at the temperature 8 ℃ above the Room temperature. If you hope to operate at a lower temperature, you can switch off the door heating to make the equipment work at the temperature 5 ℃ above the surrounding. There will be condensed water formed at the corner of the glass door. The door-heating switch is “ON” at normal condition (refer to function 5, P19), and the additional heating system is always on the new added slowly heating and normally heating mode could make the incubator work at the different temperature. Anyway, normal heating mode is suggested.

■ **Humidity:**

The distilled water in the pool vaporize and humid the air inside the chamber, and the humidity at normal condition is ⩾95%.

The condensed water will not appear at the top of the chamber and on the door because the particular heating system is used. Instead, it will gather at the other sides of the inner chamber.

The container of the pool: 3L distilled water.

**Please ensure that there is no chemical material in the water or it will canker the pool.**

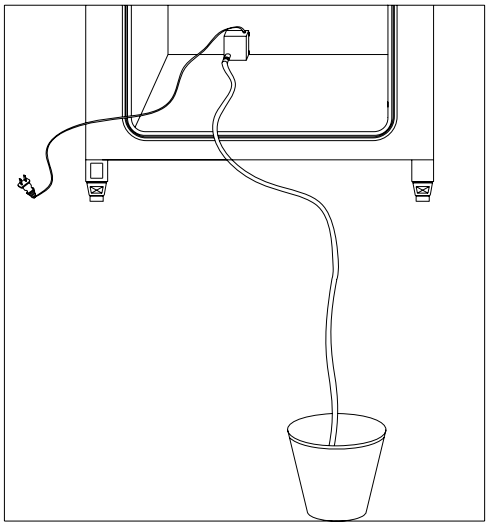
Each incubator is equipped with an electric suction pump.

**Steps of using:**

※Take out the draining pipe in the bag.

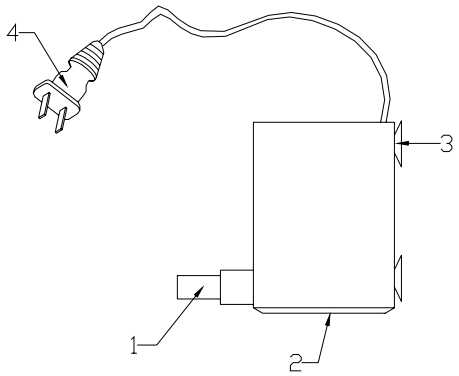
※Remove the lower shelf inside the chamber.

※ Connect one point of the pipe to the discharge



Picture 4:Draining

## Equipment Description




**Picture 5: Electric Suction Pump**

1. Drainpipe
2. Bottom of pump
3. Osculum
4. Plug

port of the electric suction pump.

※ Put the other point into the bucket.

※ Install the four osculums onto the back of chamber (below the wind channel) and put the bottom into the water.

※ Educe the plug and put it into the 220V power jacket.

※ The pump begins to work until the c hamber is dried.

※ Take off the plug and remove the pump from the chamber.

※ Unplug the drainpipe and dry the pump.

※ Dry the pool.

**Attention of using the pump:**

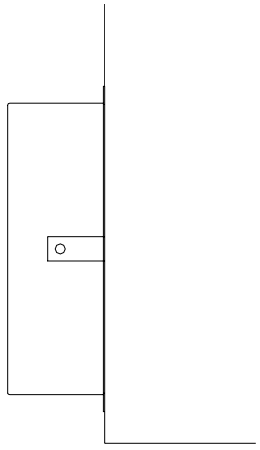
★ The pump cannot run without sopping up.

★ Do not make the pump run for more than 10 minutes.

★ Drainpipe must be connected when draining.

★ Dry the pump after draining.

★ **Don't take water to the plug of pump because of the AC 220V working voltage.**



**Picture 6:$CO_2$ entrance**

■ **Gas Source**

The joint of the gas entrance is at the back panel of the equipment (refer to Picture 6).

The max input press is **1 bar.**

**Please carefully check the joint of gas entrance!**

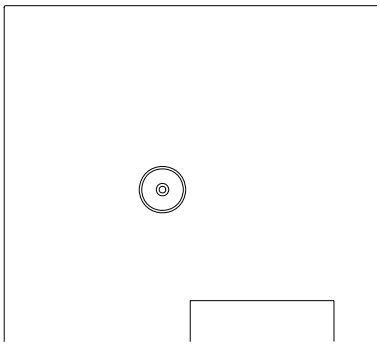
The gas will pass a filter and enter the chamber after the grain larger than 0.3μm being sieved. The sieving ratio is 99.998%, and the blower mixes the inputting gas and air inside.

**CO2 gas should be high pure food-class gas.**

■ **Door Switch:**

There is a switch at the back of the glass door. This switch will cut the gas supply and the heating system to prevent the inputting gas and overheating. All the display will glitter until the door is closed. If the door remains open for 5 minutes, the equipment will give out an alarm. The outer door can only be closed when the glass door is closed and gastight.

## Equipment Description



■ **Press Compensation:**

The press compensation hole prevents the abnormal press when the gas enters and assimilating of air when glass door is open (See Picture 7).

**The equipment should be placed with good compensation to ensure the gas letting by valve can be cleaned in time.**

**Picture 7: Pressure Compensation Hole**

## Micro Control System

**The System includes the following separated control function:**

**a) Data Control:**
Set Range:
※Temperature : 5.0℃…50.0℃
※$CO_2$ : 0.0%…20.0%

**b) $CO_2$ Zeroing**
Adjust the $CO_2$ testing system

**c) Supervisor:**
※ Door Control
※ Wrong Message
※ Malfunctions Restoration
※ Codes of Malfunction

**d) Special Function**
※ Buzzer: On/Off
※ Gas Supply: On/Off
※ $CO_2$ Adjusting
※ Set Point: Lock
※ Heating Mode: Slowly/Normally
※ Door Heating: On/Off

**a) Data Control**

■ **Temperature**
A Pt1000 resistance of Micro Control system controls the chamber temperature.

■**$CO_2$ Control:**
In order to keep the stabilization of pH value of the samples, the concentration of $CO_2$ in the chamber should be controlled. The concentration of $CO_2$ depends on the expected pH value and the content of buffer solution of $NaHCO_3$ in the incubation medium. The measure of $CO_2$ is a continuous process based on the thermal conductivity of inner chamber. Thus, the input of $CO_2$ will cause the change of the thermal conductivity inside the chamber and form a signal indicates that there is a direct ratio between thermal conductivity and concentration.

## Micro Control System

**b) Self-adjusting of Measuring System**

Regular AUTO-START function

The Measuring System needs adjusting before operating or modifying the SET temperature. It will be preceded when AUTO-STARTING.

The equipment will do self-adjusting to the measuring system when the temperature and humidity both reach steady state. The process costs 15 hours if it is started at the room temperature. Please ensure that the chamber is only filled with air.

**Suggestions: Do AUTO-START every six weeks or whenever the temperature is changed!**

**c) Supervisor Function:**

**※ Door Control:**

All the actual values displayed will glitter until the glass door is closed. The 5 minutes' lasting of door open will be considered as malfunction and a malfunction code will be given out.

**※ Malfunction Identification:**

Micro Control System supervises all the data and possible malfunctions. All the SET value has a range, and the equipment will give an alarm together with the wrong message if the actual value is out of the range.

**※ Error Range:**

- Temperature: ±0.5℃
- $CO_2$: ±1.0%$CO_2$

**※ Wrong Message:**

Each malfunction identified by Micro Control System has a special code that will help you recognize the reason of malfunction.

The radiation digital tube will glitter when malfunction occurs to inform you the situation, and if the buzzer is connected, you will also hear sound signal. If you keep pressing 〖i〗 key, you will get the code of malfunction on the display, and if there is no faults, it will display 〖- - -〗.

**※ Attention:**

Please press 〖i〗 key to get the code at first when malfunction occurs.

Following actions may interrupt wrong Message:

* Change the SET value
* Switch on/off the equipment

## Micro Control System

■ **Code Table of Malfunction:**

| Code of Malfunction | Possible Reason | Solutions |
|---|---|---|
| 99 Glass door is open | Glass door is not closed | Close the door |
| 100 Temperature too low (Set point) | Door heating is switched off | Switch on the door heating (Function 5) |
| 101 Temperature too high (Set point) | Surrounding temperature too high | Switch off the door heating (Function 5) |
| 200 $CO_2$ too low （Set point） | $CO_2$ not connected<br>$CO_2$ is used up<br>Low press of $CO_2$ entrance | Connect the gas<br>Replace the $CO_2$ bottle<br>Adjust the press to 1bar |
| 201 $CO_2$ too high （Set point） | High press of $CO_2$ entrance | Adjust the press to 1bar |

**d) Special Function:**
Adjusting Page 19
Choose the following functions by 〖cal〗+〖▼〗 or 〖▲〗

■Buzzer: On/Off
■Function 1:
You will hear a sound signal when malfunction occurs if the buzzer is on.
Switch off the buzzer: “Silent”.

Default set: Buzzer is on

■Gas supply On/Off
■Function 2:
The gas source will be cut off if you choose “Gas OFF”, and the green diode “Gas” will crush out.

Default set: Gas On; the green diode “Gas” lights when the gas enters.

■ $CO_2$ zeroes
■ Function 3
If the warp of $CO_2$ display is too large, the function allows manual zeroing $CO_2$.

■Lock the SET point:
■Function 4:
This function allows you lock the SET point of temperature and $CO_2$ SET value and these points will not change when the equipment is wrongly operated.

Default set: Unlocked

## Micro Control System

■Door Heating: On/Off
■Function 5:
The main heating system allows the equipment working at the temperature 8℃ higher than the surrounding. If you want to operate at the temperature 5℃ higher than the surrounding, you can simply switch off the door heating system. But condensed water will form on the glass door.

Default set: Door heating system on.

■ Heating Way: Normally/Slowly
■ Function 6:
The two different heating ways ensure the equipment working normally at different temperature. The Slowly Heating Way is suitable for high-temperature situation. Normally Heating Way is suggested.

Default Set: Slowly Heating

■Operational Way: Default Set
■Function 7 :
This Set id to test the function of the incubator, please set to 1.

Default Set: 1

■Operational Way: Monitoring the surrounding temperature
■Function 8 :
Monitor the surrounding temperature to make the temperature inside the chamber steadier.

Default Set: Monitoring the surrounding temperature

## Overheat Protection

■ **Temperature Limit Controller (TLC):**

There is a separated TLC to protect the incubator.

When the temperature control circuit is out of control, the TLC will control the power in case it is 1.5℃ higher than the set value.

The red light (over-temp) will be lit when the TLC responds.

If the TLC is charged with the controlling, please refer to the code table of malfunction to find out the reason.

## Placing Position and Installation

Open the box and take out the components.

■ **Positioning:**

The incubator must be put at the irremovable place.

Avoid direct irradiation from the sun.

The placing position should keep dry and the surrounding temperature cannot be higher than 30℃ (18℃-30℃ is the most suitable).

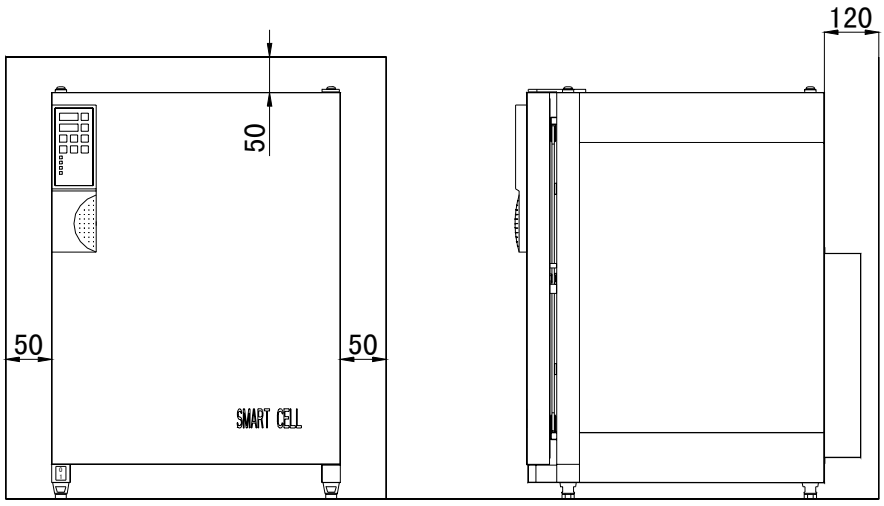
Keep the equipment at a level place and the bracket should be shake resistant and apyrous.

$CO_2$ is needed when the incubator is working while $CO_2$ is also harmful to health, so the placing position must be good ventilation. The gas discharged from the back panel must be immediately carried off.

The equipment cannot work without ventilation device, thus, if several equipments are in the same room or the equipment is placed at the bottom of the lab, additional ventilation device is needed.

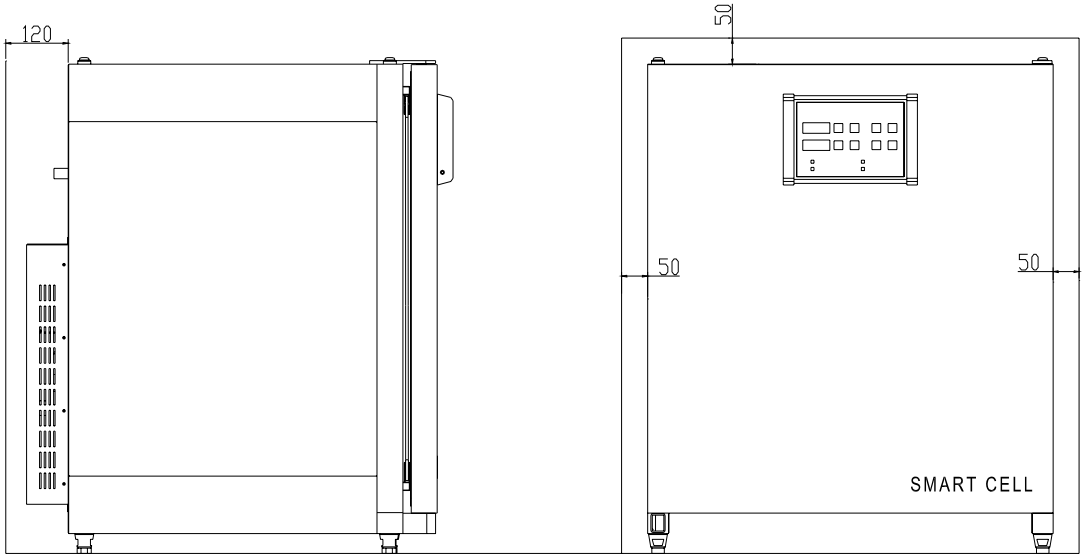
For the detail of gas releasing, please refer to the appendix.

■**Space:**
There should be some space left between the equipment and the wall or other instruments. (refer to picture 8,9)




**Picture 8: Space between the HF90 incubator and the wall（mm）**

## Placing Position and Installation




**Picture 9: Space between the HF240 incubator and the wall（mm）**

**The press compensation hole at the back panel cannot be jammed.**

■ **Stacking: (See picture 11 P30, picture 12 P31)**

■ **Installation and Connection of Gas Source:**
The correspondent-connecting interface is at the back of equipment (See picture 6 P10).
The connecting pipe is included with the unit.
The gas entering the equipment should first pass a reduction valve to reduce the press to 1 bar.
The press of 1bar cannot be changed for safety reason.

■ **$CO_2$:**
Connect the reduction valve to the equipment again.

■ **Attention:**

**CO2 gas should be food class and its purity is at least 99.5%. CO2 Cylinder with cat is not allowed.**

The sensor with high sensitivity is used in this incubator, and it cannot be used under electromagnet interference (e.g. mobile phone).

■ **Put through the Main Power:**
Please ensure the power supply matches the power written on the nameplate before putting through the power.
There is a grounded power cable together with the incubator.
The main power needs 2 4A fuses.

## Startup

The surrounding temperature is at least 8℃ lower than the SET value.

※ Keep the outer door and glass door open.

■ **Distilled water used:**

※ Pour the distilled water into the pool (approach the room temperature)

Input Quantity: 3L

Avoid overflow during the inputting.

Ensure the humidity inside the chamber will not change.

※ Open the cutoff valve of the bottle

※ Switch on the main power

- The green light is on
- 〖888〗 will be displayed for about 40s.
- Regular Self-checking
- Actual value will be displayed after Self-checking.

■ **Adjust the SET Point:**

Keys used: 〖℃〗 , 〖▼〗/〖▲〗

※ Keep pressing 〖℃〗 key to adjust the 〖℃〗 value:

※ Keep pressing 〖%$CO_2$〗 key to adjust the 〖%$CO_2$〗 value:

- Display the value being set last time
- The last number of the display glitters
- Set the expected value by 〖▼〗 or 〖▲〗 key, and the value will be stored after loosening the SET keys and the actual value will be again displayed.

■ **Default Set:**

Temperature: 37.0℃

$CO_2$: 0.0%

**Attention!**
**Only air gas can be in the chamber.**

AUTO-START

※ Keep pressing the 〖auto-start〗 on the control panel for 10s.

- "OPEN DOOR": The temperature display panel will show 〖opE〗, "%$CO_2$" display panel will show 〖dor〗, and open the outer door and glass door for about 60s.
- The Auto-start mode is activated and the "%$CO_2$" display panel will show 〖0.0〗 and the "℃" display panel will show the actual value after closing the doors.
- "GAS" light is off and "AUTO-START" light will be on.

※ Close the doors

## Startup

■ **Attention:**

Heat the equipment to the SET value and establish the relative humidity.

After regular AUTO-START:
- "Auto-start" light will be off
- Actual value displayed

The equipment will continuously input the gas until it reaches the SET value that has been set.

- The equipment can now be used in incubating work.

■ **Special Functions:**

〖cal〗 and 〖▼〗 or 〖▲〗 keys

You can choose and set the special function by 〖▼〗 and 〖▲〗 key when keeping pressing the 〖cal〗 key.

"℃" will display the Function code 〖1〗, and press 〖cal〗again after loosen it, "%$CO_2$" display window will show the actual mode. The mode can be changed by pressing 〖cal〗 + 〖▼〗/〖▲〗.

| Function Name | "℃" Display Window | "%$CO_2$" Display Window | Function | Default Set |
|---|---|---|---|---|
| 1 Buzzer | 〖 1〗 | 〖A 1〗<br>〖A 0〗 | On<br>Off | On |
| 2 Ventilation | 〖 2〗 | 〖G 1〗<br>〖G 0〗 | On<br>Off | On |
| 3 $CO_2$ Zeroing | 〖 3〗 | 〖 .0〗 | $CO_2$ Zeroing | |
| 4 Opening Set | 〖 4〗 | 〖S 0〗<br>〖S 1〗 | Not Opened<br>Opened | Opened |
| 5 Door Heating Switch | 〖 5〗 | 〖d 1〗<br>〖d 0〗 | On<br>Off | On |
| 6 Heating Way | 〖 6〗 | 〖h 0〗<br>〖h 1〗 | Slowly<br>Normally | Slowly |
| 8 Monitor the Surrounding Temperature | 〖 8〗 | 〖P 1〗<br>〖P 0〗 | Not Monitoring<br>Monitoring | Monitoring |

Please refer to Page13-Page14 for details.

## Startup

■ **Attention:**

■ **Temperature:**
Please restart AUTO-START for calibration when setting temperature is over 1℃, which make the unit works precisely.

■ **$CO_2$ Comparison**
If the value of $CO_2$ concentration measured is different from the value showed on the 〖%$CO_2$〗, you can adjust $CO_2$ zeroing by manual. Unit will recover to the original $CO_2$ zeroing after next AUTO-START operation.

■ **Example for Reference:**
$CO_2$ display value: 7.0% $CO_2$
$CO_2$ actual value: 6.2% $CO_2$

※Choose function No. 3 by 〖cal〗 key and 〖▲〗 key.
※Loosen the 〖cal〗 key
※Press the 〖cal〗 key again

- The 〖℃〗 displays 〖 3〗 and glitters.
- "%$CO_2$" display window shows 〖 .0〗
  ※Input the actual $CO_2$ concentration value into the temperature display window by 〖cal〗+〖▼〗/〖▲〗.
  ※Loosen the 〖cal〗 key.
  ※Press 〖i〗 to confirm.

$CO_2$ will display the modified concentration. If the actual value is higher than the SET one, please keep the door open for one minute to let the extra gas out.

■ **Important:**
※Please pour out the water in the pool and dry the chamber if the equipment is not to use for a period of time.

※Do not switch on/off the equipment continuously.

※Please keep the door closed and try to shorten the opening time when necessary to ensure the best situation of the chamber.

■ **〖i〗 key**
If any malfunction occurs during work time, the corresponding display will glitter, and if the buzzer is connected, you will hear a sound alarm at the same time. You can know the reason of malfunction by pressing 〖i〗 key, and the display window will show the code of malfunction.
(Refer to the table of malfunction code Page21)

## Table of Malfunction Code

**Please check the following to solve the problem more quickly.**

| Code of Malfunction | Reason of Malfunction | Solutions |
|---|---|---|
| 99 Glass door is Open | Glass door is not closed | Close the door |
| 100 Temperature too low (SET point) | Door heating is switched off | Switch on the door heating (Function 5) |
| 101 Temperature too high (SET point) | Surrounding temperature too high | Switch off the door heating (Function 5) |
| 200 $CO_2$ too low (SET point) | $CO_2$ gas not connected<br>$CO_2$ bottle is used off<br>$CO_2$ entrance press too low | Connect the gas input<br>Replace the $CO_2$ bottle<br>Adjust the entrance press to 1bar |
| 201 $CO_2$ too high (SET point) | $CO_2$ entrance press too high | Adjust the entrance press to 1bar |

- **Please contact the maintaining engineer if the table above cannot solve the problem.**

■ **Malfunction that cannot be shown by the equipment**

| Malfunction | Way of Checking |
|---|---|
| * Equipment does not heat | - Check the SET value |
| * No gas entrance | - Check the diode GAS.<br>*Check if the input is switched off.<br>- Check the SET value |
| *Buzzer does not give out alarm when malfunction occurs. | - Check if the buzzer is switched on. Please check the special function. |
| *SET value cannot be changed | - SET point is locked. Please check the special function. |
| *There is much water on the glass door. | - Check if the door heating is switched on. |

■ **Switch Off:**

* Switch off the main power
* Switch the gas reduction valve

## Disinfection, Cleanness, and Examine

■ **Need to Do Once a Week:**

* Check the water level of the pool.

* Check if the entrance press is 1bar.

Warning: Hot surface in Disinfection mode, don't touch and open the door.

■ **Clean the Chamber with 90℃ moist heat diinfection (suggestion: once per 2 months)**

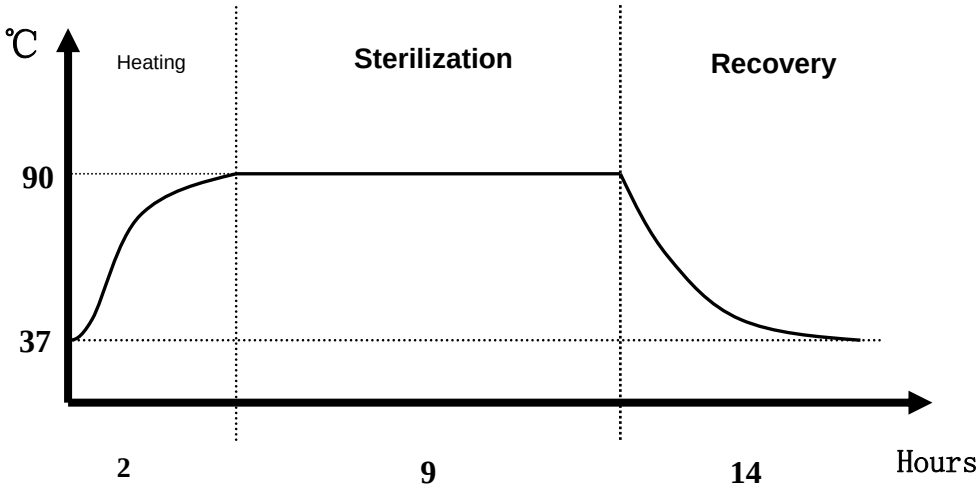
* Switch off

* Open the glass door

* Dry the chamber

* 90℃ moist heat disinfection

★ **The whole procedure of 90℃ moist heat disinfection.**




Picture 10: The procedure of the 90℃ moist heat disinfection

★ **Way of 90℃ moist heat disinfection:**

- Open the outer door and glass door, **and take out all the materials inside the incubator!**
- Dry and clean the incubator, and input **300ml** distilled water.
- Close the glass door and outer door. Turn on the power supply.
- Keep pressing the〖90℃〗button on the display panel until the green light "90℃" on the display panel lightens.
- Wait for about 10s, the "℃" display window will show 〖OPE〗and "%$CO_2$" display window will show 〖dor〗. **Please check id there is anything left inside the incubator!** Please do this after opening the outer door and glass door.
- After keeping opening for one minute, the "%$CO_2$" window will show 〖-25〗and "℃" window will show the actual value of temperature and glitter, which indicates the disinfection procedure will last for 25 hours. Please close the doors!
- The equipment now begins the disinfection.

## Disinfection, Cleanness, and Examine

**★Explanation of 90℃ moist heat disinfection.**

The whole procedure is divided into three phases:

①Heating ---The heating procedure will increase the temperature to 90℃, and the procedure will last for 2 hours (based on surrounding temperature)

②Sterilization---The temperature has arrived 90℃, and the sterilization will last for 9 hours.

③Recovery---The equipment will return to the incubation mode (decrease the temperature), and the procedure will last for 14 hours.

**Note: The procedure of disinfection may last for longer time in the conditions where the heat is difficult to emit. If the procedure is over 25 hours while the temperature has not recover to 37℃, then "%$CO_2$" will always display 〖.4〗(4 hours remains). At that time, operator can terminate the disinfection manually by keeping pressing〖90℃〗key until the light goes out, which will not affect the disinfection.**

Input 3L distilled water and do "SUTO-START" after disinfection! Incubation can only be started after "AUTO-START"!

The "℃" window displays the actual value of temperature while the "%$CO_2$" window has three displays show the remaining time and remind you the current phase.

Phase 1, the cursor of the "%$CO_2$" window is climbing in ①.

E.g.: 〖.25〗 ⟶ 〖-25〗⟶ 〖¯25〗;

Phase 2, the cursor of the "%$CO_2$" window is at the middle and glittering in ②.

E.g.: 〖-23〗 ⟶ 〖-23〗;

Phase 3, the cursor of the "%$CO_2$" window is descending in ③.

E.g.:〖¯14〗 ⟶〖-14〗 ⟶ 〖.14〗.

## Disinfection, Cleanness, and Examine

■ **Warning:**

Please do the cleaning and disinfecting before informing the maintaining engineer.

■ **Maintenance**

We can assure the normal condition of the equipment only when it is maintained or improved by engineers authorized by **Shanghai Lishen**. The equipment should be overhauled every a certain time to ensure the normal condition.

※ **Suggestion: The equipment needs an annually check to keep working properly. Each Incubator is strictly checked before being putting into use, and it can suit your daily needs. Please contact the engineer of Heal Force if you want to keep it at top precision.**

※ **Condition for Normal Use:**

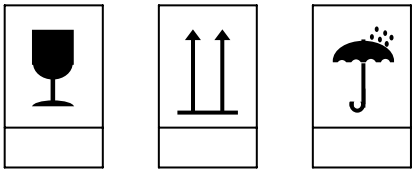
A. Ambient temperature: 18℃-30℃
B. Relative humidity: <80%
C. There is no violent shake or corrosive gas near the equipment.
D. No effects from sunshine or other heat or cooling source.

※ **Shanghai Lishen reserves all the rights of updating and improving of the product.**

## Warranty

- The warranty period is one year after purchasing.
- Our company will not take responsibilities if the malfunctions are caused by improper use even it is within the warranty period.
- Our company will responsible for the maintenance after the warranty period, but a certain amount of cost will be provided.
- Please show the related materials to the authorized personnel.

◆**Protection Signals:**



**Avoid shaking、knocking and water during the transporting.**

**Condition of transportation and restoration: Temperature: -40℃ ~ +55℃, humidity: ⩽95％**

**Adjust the Data:**
The equipment should be adjusted regularly to ensure the best working condition. The user could adjust the equipment under the help of professional personnel at least once a year.

**Condition of Temperature Adjusting:**
Put a thermometer with the minimum scale as 0.1℃ into the center of the incubator. Wait for another 2 hours after the temperature value is steady, and note the actual value.

**Way of Temperature Adjusting:**
- Open the outer door, observe the temperature inside the chamber and note it down.
- Close the outer door and keep pressing the 〖cal〗 key for more than 5s.
- Loosen the 〖CAL〗 key when the glittering "cal" appears on the display window.
- The "%$CO_2$" window will display the temperature value if you press the 〖℃〗 key.
- Adjust the temperature according to the noted actual value by pressing 〖▲〗 or 〖▼〗 key.
- Confirm by pressing 〖i〗 key.
- Repeat the above steps until the precise temperature.

**Condition of %$CO_2$ adjustment:**
The temperature and humidity of incubator is steady and keep the situation for more than 2 hours. The concentration of $CO_2$ should be 0%.

**%$CO_2$ zero adjusting:**
- Press 〖%$CO_2$〗+〖▼〗 to set "%$CO_2$" to ".0"
- Press 〖cal〗 key for more than 5s
- Loose the 〖cal〗 key when "CAL" is glittering in the temperature display window.
- Press 〖AUTO-START〗 once to make "0.0" appear in the window.
- Loose 〖AUTO-START〗 and press 〖i〗 until the "0.0" is glittering in the window.
- The procedure will be completed after two or three minutes.

**Adjust the concentration of %$CO_2$:**
(The concentration should be higher than 2%, usually is 5%-7%)
- To set the concentration of CO2 5.0%. Wait for more than 0.5 hour for stabilization, then measure the real concentration.
- Press 〖cal〗 for more than 5s
- Loose the 〖cal〗 key when "CAL" is glittering in the temperature display window.
- Press 〖%$CO_2$〗 once and the concentration will be displayed in "%$CO_2$" window.
- Adjust the concentration by pressing 〖▲〗 or 〖▼〗according to the actual value.
- Confirm by pressing 〖i〗 key.
- Repeat the steps above until the value is according with the precision.

HF90 Technical Data:

| | | DATA | UNIT |
|---|---|---|---|
| Size | | | |
| Shell | Width | 637 | Mm |
| | High | 909 | Mm |
| | Depth | 762 | Mm |
| Chamber | Width | 470 | Mm |
| | High | 607 | Mm |
| | Depth | 530 | Mm |
| Cubage | | 151 | L |
| Shelf | | | |
| Number of Shelves | | | |
| | Standard | 3 | Floor |
| | At most | 10 | Floor |
| Size | | | |
| | Width | 423 | mm |
| | Depth | 445 | mm |
| Net Weight | | 85 | Kg |
| Electric Data | | | |
| Rated input voltage | | 230 | V~ |
| Rated Power | | 0.65 | kW |
| Rated Power Frequency | | 50/60 | Hz |
| FUSE | | AC250V F6.3 A | |
| Digital Temperature Control | | | |
| Range | | +5—50 | ℃ |
| Power Cost at 50℃ | | 0.1 | kW |
| **Chamber Deviation (DIN 12880)** | | ±0.4 | ℃ |
| Transient Deviation (DIN 12880) | | ±0.1 | ℃ |

| | DATA | UNIT |
|---|---|---|
| Digital $CO_2$ Control<br>Set Range<br>Set Precision<br>Recovery Time<br>Gas Source | <br>0—20<br>±0.1<br>About 1<br>About 3.7 | <br>%$CO_2$<br>%$CO_2$<br>%$CO_2$/min<br>L/min |
| Humidity<br>Relative Humidity<br>Coat<br>Texture Paint | <br>>95<br><br>9002 | <br>%<br><br>RAL |
| Data of Gas Source<br>Filter Ratio<br>Grain<br>Strained Purity Ratio<br>At Least Entrance Press | <br>99.998<br>>0.3<br>99.5<br>1 | <br>%<br>μm<br>%<br>bar |
| Yawp | < 60 | dB（A） |
| Capacity of Distilled Water | 3 | L |

HF240 Technical Data:

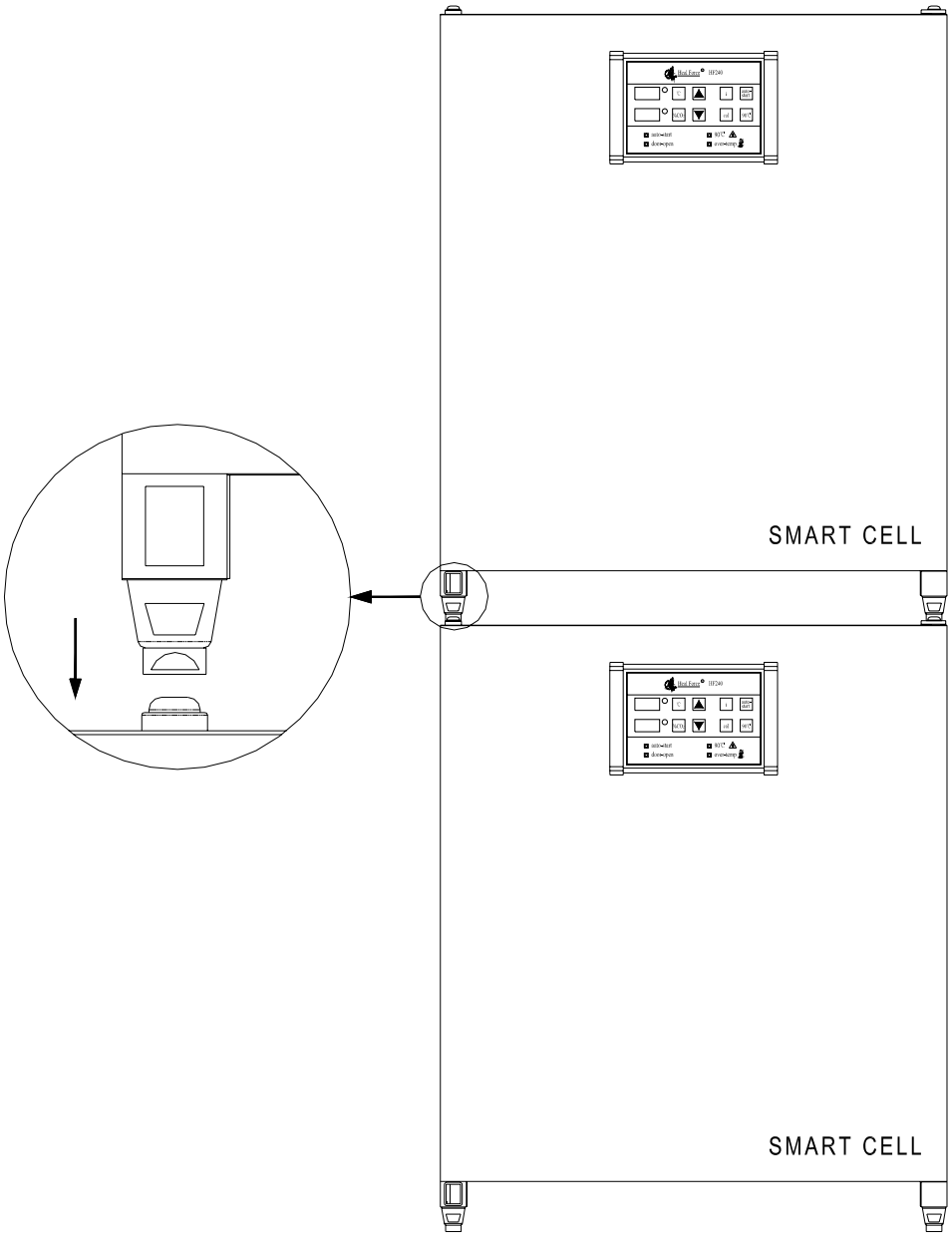
| | | DATA | UNIT |
|---|---|---|---|
| Size | | | |
| Shell | Width | 780 | Mm |
| | High | 944 | Mm |
| | Depth | 820 | Mm |
| Chamber | Width | 607 | Mm |
| | High | 670 | Mm |
| | Depth | 583 | Mm |
| Cubage | | 240 | L |
| Shelf | | | |
| Number of Shelves | | | |
| | Standard | 3 | Floor |
| | At most | 12 | Floor |
| Size | | | |
| | Width | 554 | mm |
| | Depth | 503 | mm |
| Net Weight | | 98 | Kg |
| Electric Data | | | |
| Rated input voltage | | 230 | V~ |
| Rated Power | | 0.735 | kW |
| Rated Power Frequency | | 50/60 | Hz |
| FUSE | | AC250V F6.3 A | |
| Digital Temperature Control | | | |
| Range | | +5—50 | ℃ |
| Power Cost at 50℃ | | 0.1 | kW |
| **Chamber Deviation (DIN 12880)** | | ±0.4 | ℃ |
| Transient Deviation (DIN 12880) | | ±0.1 | ℃ |

| | DATA | UNIT |
|---|---|---|
| Digital $CO_2$ Control<br>Set Range<br>Set Precision<br>Recovery Time<br>Gas Source | <br>0—20<br>±0.1<br>About 1<br>About 3.7 | <br>%$CO_2$<br>%$CO_2$<br>%$CO_2$/min<br>L/min |
| Humidity<br>Relative Humidity<br>Coat<br>Texture Paint | <br>>95<br><br>9002 | <br>%<br><br>RAL |
| Data of Gas Source<br>Filter Ratio<br>Grain<br>Strained Purity Ratio<br>At Least Entrance Press | <br>99.998<br>>0.3<br>99.5<br>1 | <br>%<br>μm<br>%<br>bar |
| Yawp | < 60 | dB（A） |
| Capacity of Distilled Water | 3 | L |

## Appendix

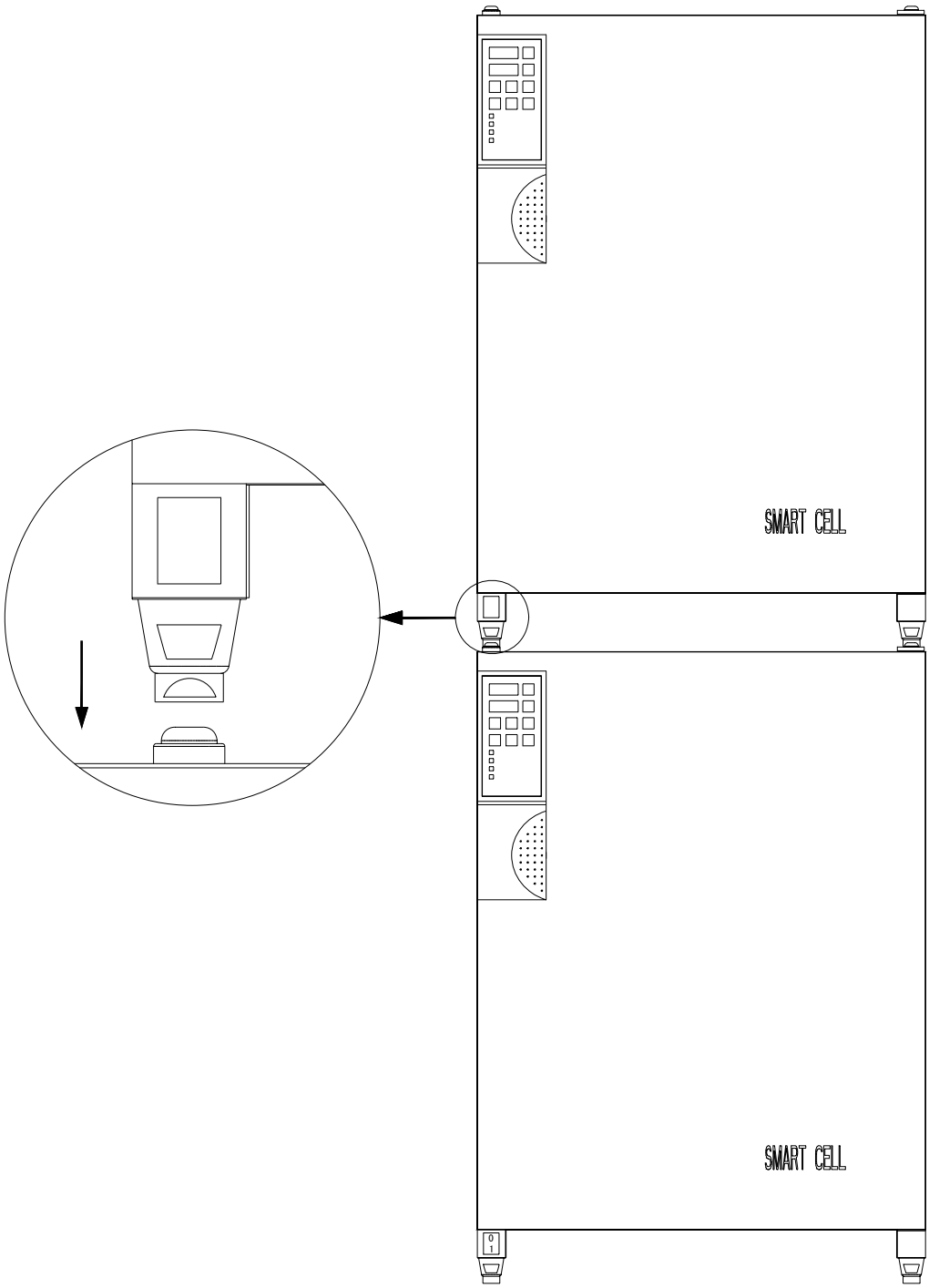
* The stacking of incubators (refer to picture 11,12).
* Capacity of gas under normal and abnormal condition.
* Appendix of $CO_2$ aeration (refer to picture 13 P.33).
* PH value based on the concentration of $CO_2$ (refer to picture 14 P.33).

# Stacking Picture of HF240




Picture 11: Stacking figure of **HF240**

## Stacking Picture of HF90




Picture 12: Stacking Picture of **HF90**

■ **Stacking of Incubators (refer to Figure 11,12)**

Additional aeration is needed if there are several equipments in one room or the equipment is installed at the ground floor of the lab.

The two equipments can be stack together by the piling feet, which are riveted on the top of the equipment.

■ **Capacity of gas under normal and abnormal condition.**

（*1） Gas required: The necessary gas quantity for SET point

（*2） Gas cost: The gas quantity at max SET point

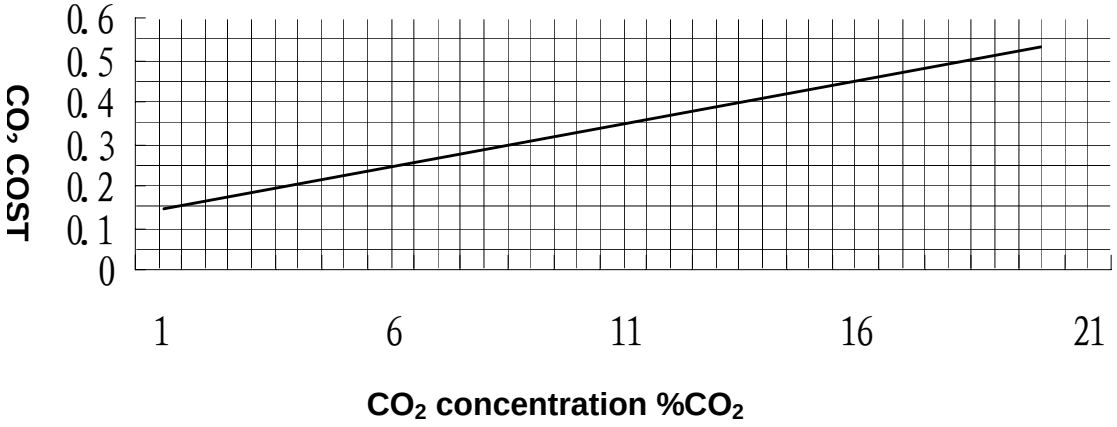
（*3）Malfunction: Gas output at the max SET point and in case of sound and light alarm (2h when malfunction).

（*4）Runoff the gas: The max gas input through the capillary per hour when the valve is open

| Type of Gas | Press of Entrance | Capillary | Excretion of Gas （*4） | Requirement of Gas (*1) |
|---|---|---|---|---|
| $CO_2$ | 1bar | 0.65mm | 222L/h | ~ 50L |

| Type of Gas | Cost of Gas （*2） | Excretion of Gas when Malfunction (*3) | High-point |
|---|---|---|---|
| $CO_2$ | ~ 0.52L/h | 444L | 5L/$m^3$ |

★ **Consume of $CO_2$ (door closed)**

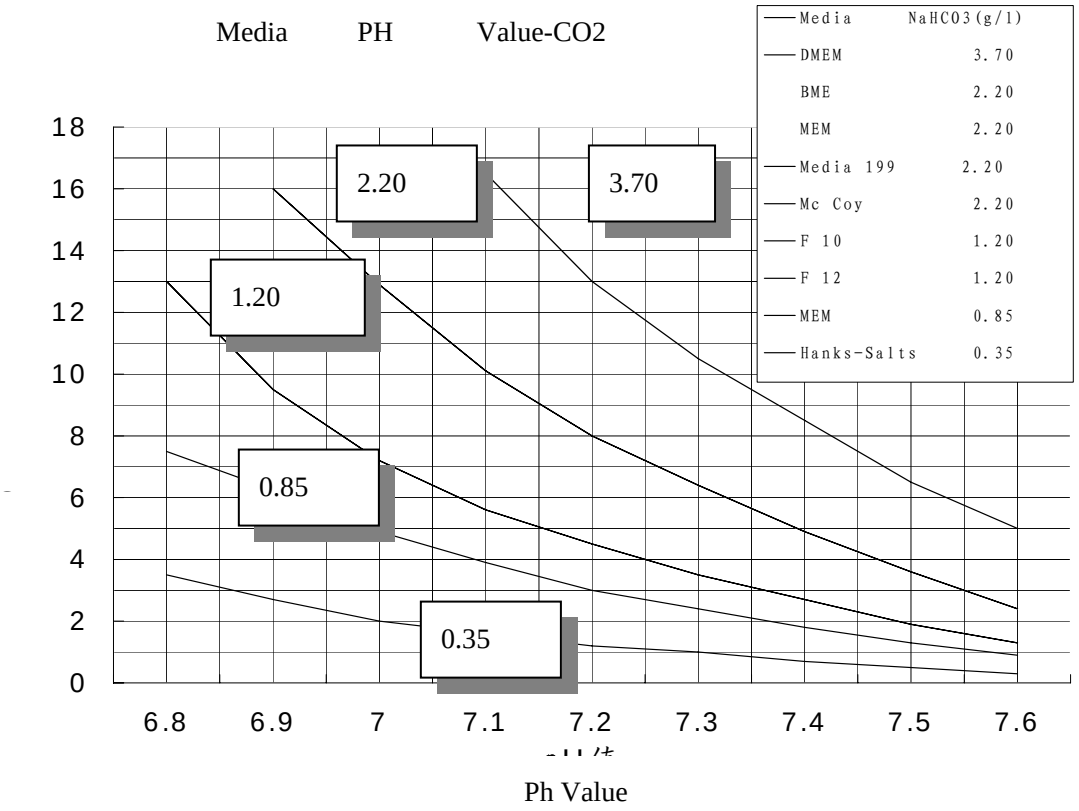



**Picture 13: Consume of $CO_2$ (door closed)**

★ **PH value of incubation liquid**

The pH value is affected by the concentration of $CO_2$ inside the incubator.

The following picture shows the relationship between pH value and $CO_2$ concentration.




**Picture 14: PH value-concentration of $CO_2$ inside the incubator**

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